Using DataFed to Build Fire-related Web Applications

Stefan R. Falke, Rudolf B. Husar, Kari Höijärvi, and Mrunal Parikh
Center of Air Pollution Impact and Trend Analysis
Washington University
St. Louis, Missouri

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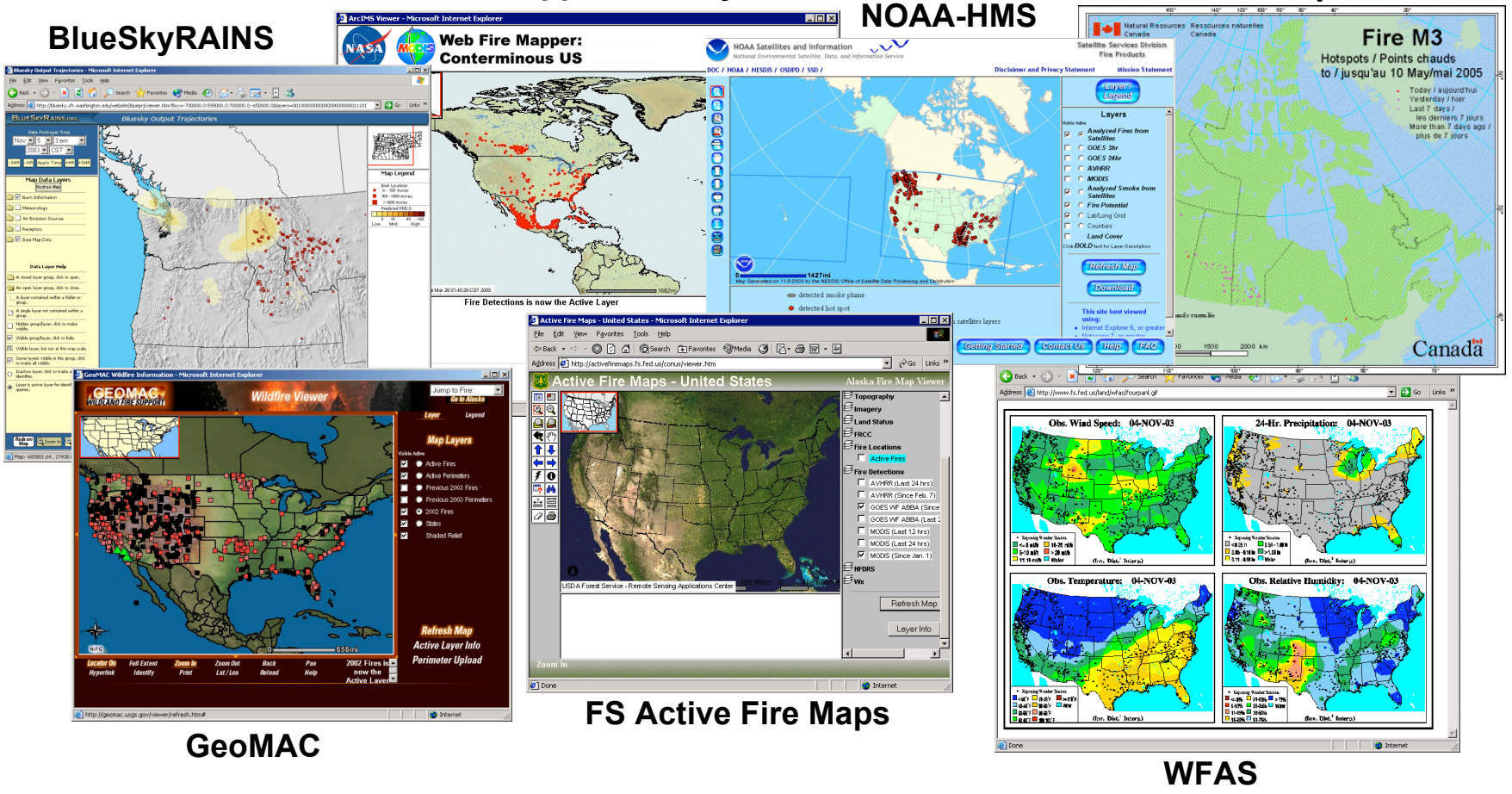
Distributed Fire Data Sources

BlueSkyRAINS

Web Fire Mapper - UMaryland

NOAA-HMS

Canadian Wildland Fire Information System



GeoMAC

FS Active Fire Maps

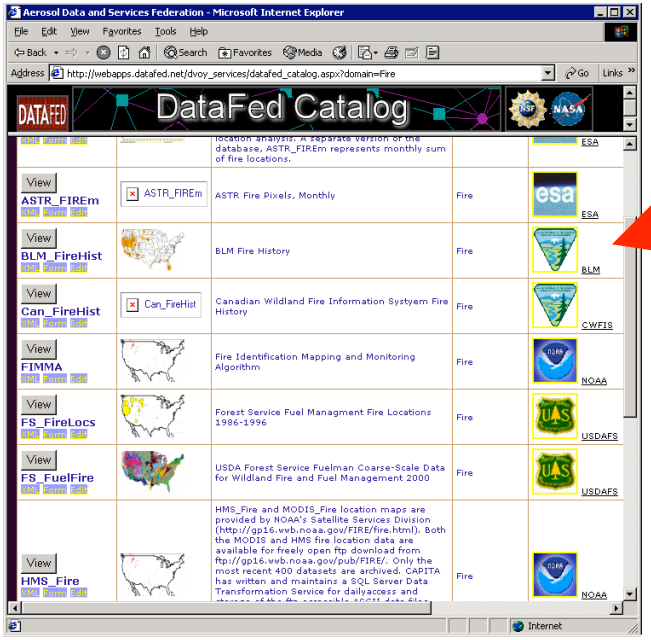
WFAS

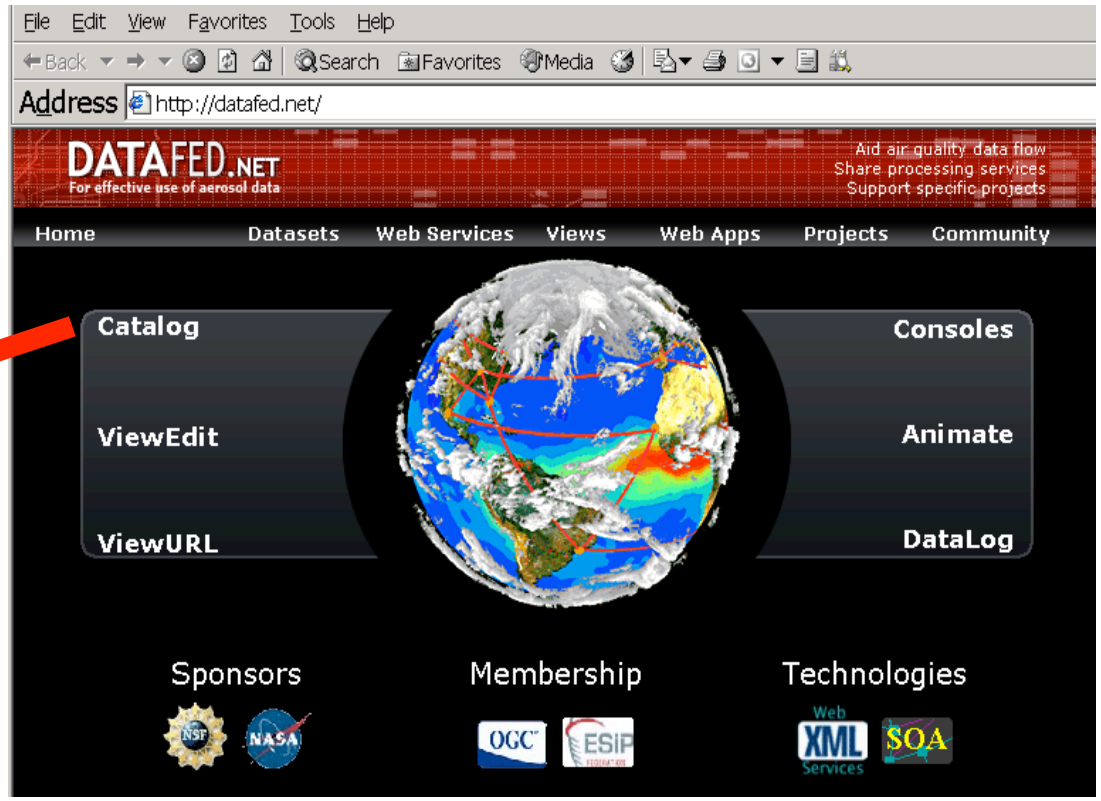
The challenge is to bring data together, on-the-fly, without requiring substantial changes to the provider data systems.

For example, air quality modelers and managers struggle with the uncertainty associated with the multiple fire location datasets that exist.

Federated Data System - DataFed

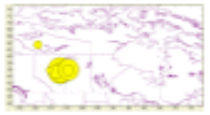
The air quality community is supported by a **non-intrusive, incremental data integration** infrastructure based on Internet standards (web services) and a set of web-tools evolving through the federated data system, **DataFed.** (Husar et al, 2004)



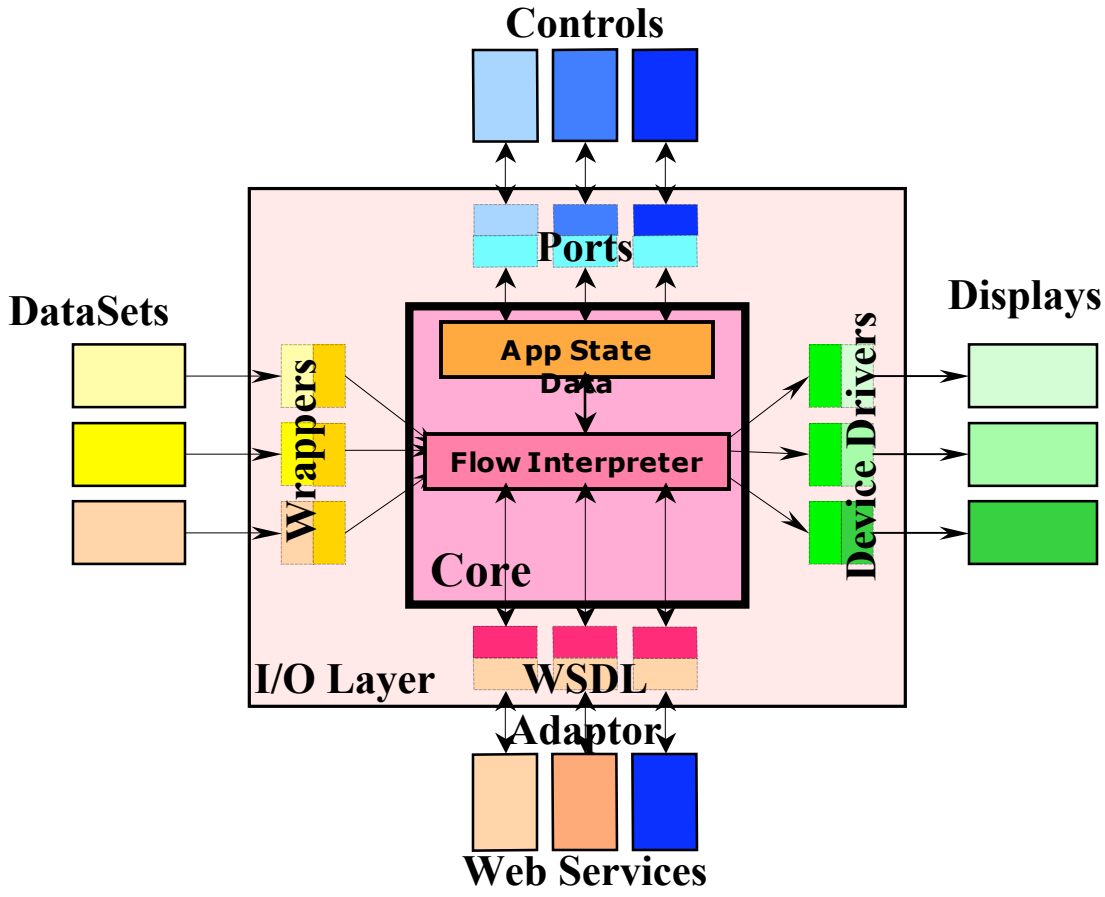


http://datafed.net

Fire-related datasets accessible through DataFed

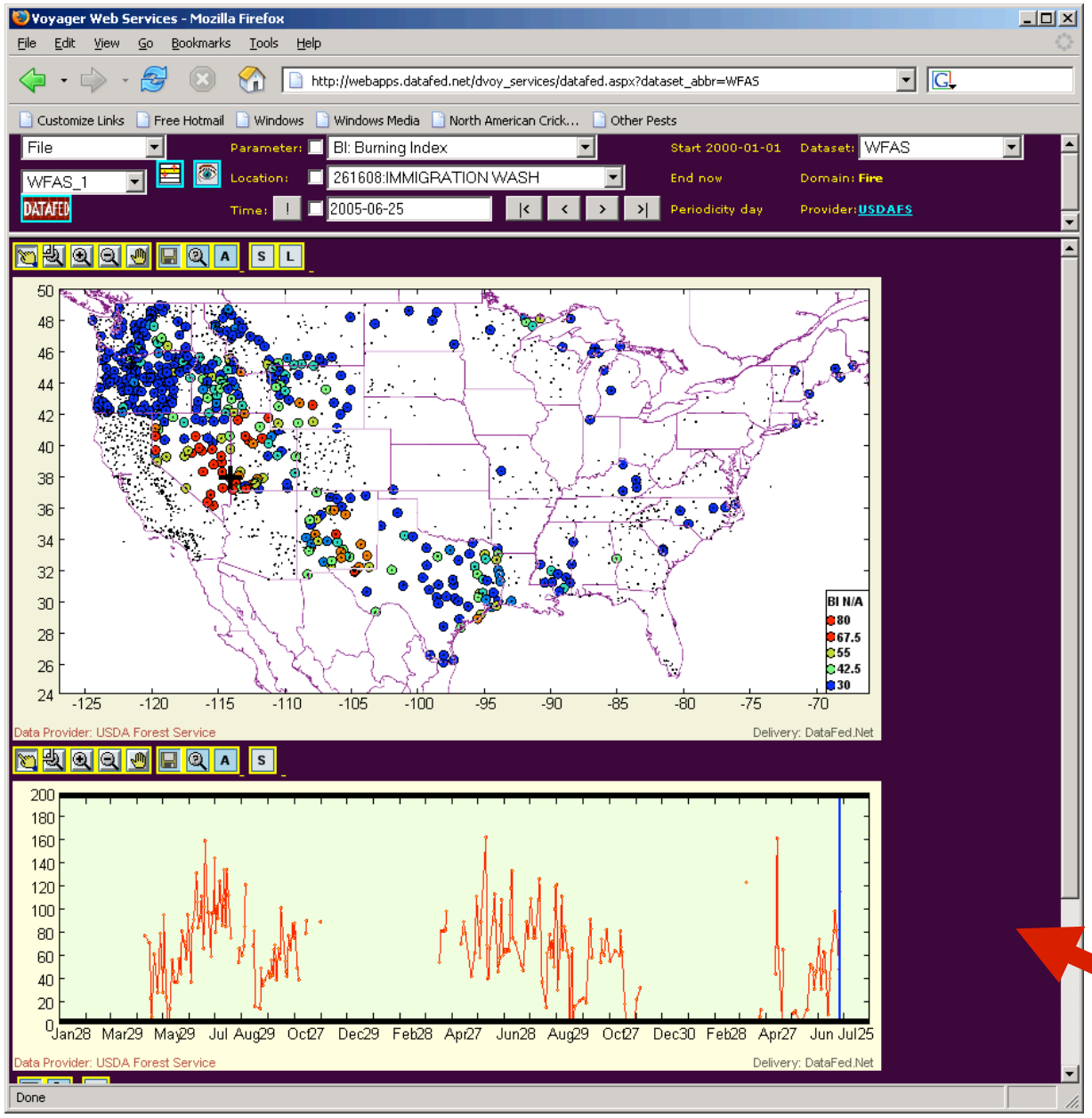
View **BLM_FireHist** XML Form Edit SOAP		BLM Fire History	Fire	BLM
View **Can_FireHist** XML Form Edit SOAP		Canadian Wildland Fire Information Systyem Fire History	Fire	CWFIS
View **FIMMA** XML Form Edit SOAP		Fire Identification Mapping and Monitoring Algorithm	Fire	NOAA
View **FS_FireLocs** XML Form Edit SOAP		Forest Service Fuel Managment Fire Locations 1986-1996	Fire	USDAFS
View **FS_FuelFire** XML Form Edit SOAP		USDA Forest Service Fuelman Coarse-Scale Data for Wildland Fire and Fuel Management 2000	Fire	USDAFS
View **HMS_Fire** XML Form Edit SOAP		HMS_Fire and MODIS_Fire location maps are provided by NOAA's Satellite Services Division (http://gp16.wwb.noaa.gov/FIRE/fire.html). Both the MODIS and HMS fire location data are available for freely open ftp download from ftp://gp16.wwb.noaa.gov/pub/FIRE/. Only the most recent 400 datasets are archived. CAPITA has written and maintains a SQL Server Data Transformation Service for dailyaccess and storage of the ftp accessible ASCII data files. The fire location data are useful to the FASTNET community in analyzing the spatial and temporal distribution of detected fires and in identifying source locations for smoke plumes.	Fire	NOAA
View **MODIS_Fire** XML Form Edit SOAP		MODIS_Fire products are received by the Satellite Services Divion from NOAA's MODIS Near Real Time Processing System in NOAA's Information Processing Division (http://www.osdpd.noaa.gov/MODIS/index.html). The MODIS instrument flies onboard the NASA TERRA and AQUA satellite, and the fire algorithm	Fire	NOAA

WS-Based Application Program Design



- The web-program consists of a stable **core** and adoptive **input/output** layers
- The core maintains the state and executes the data selection, access and render services
- The adoptive, abstract I/O layers connects the core to evolving web data, flexible displays and to the a configurable user interface:

DataFed Viewer



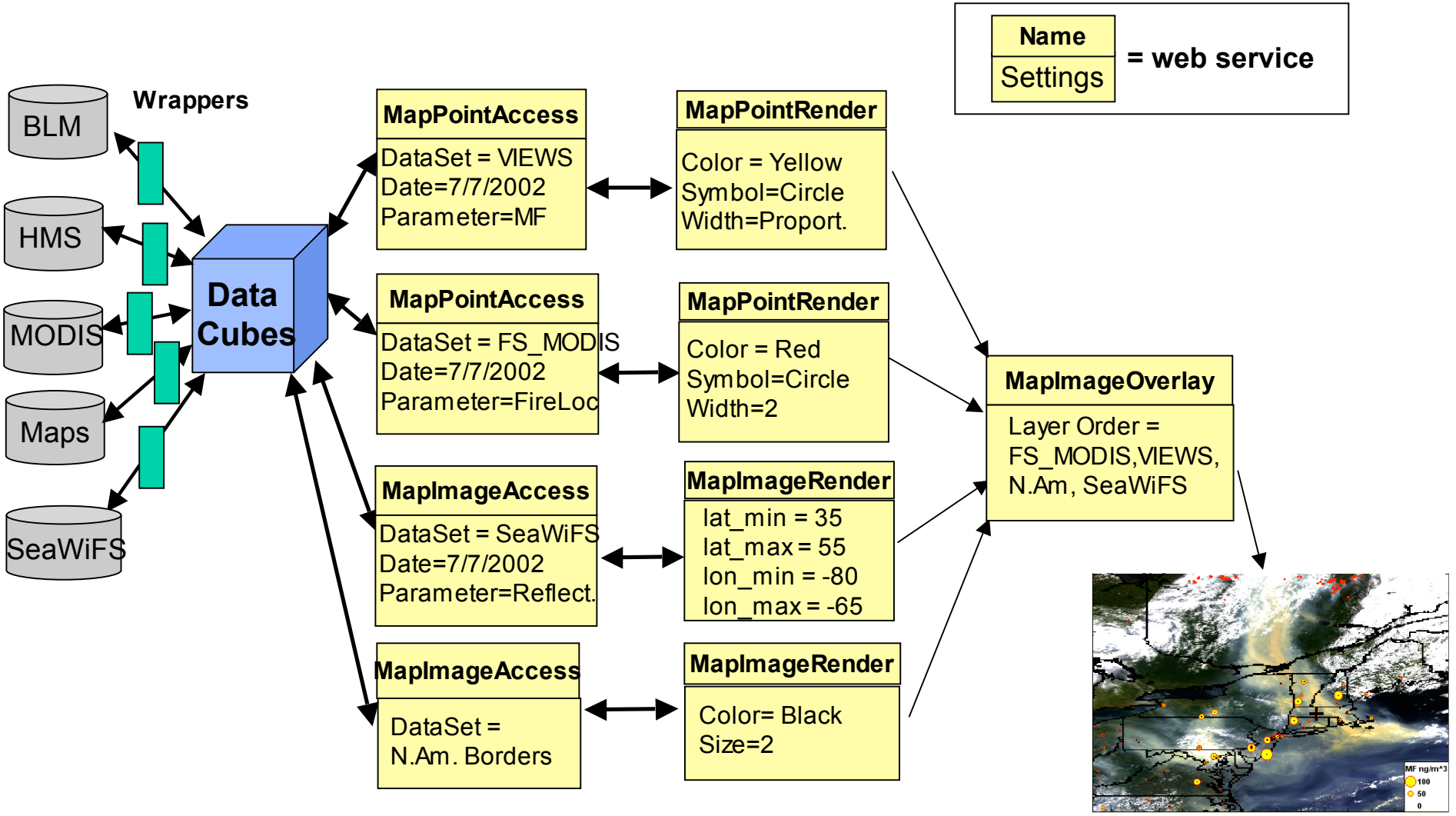
Forest Service Wildland Fire Assessment System (WFAS)

Provides fire weather data (meteorology and fire indices such as drought, burning index, and energy release) at monitoring stations.

URL-addressable text files are “wrapped” for dynamic and up-to-date DataFed browsing in maps and time series.

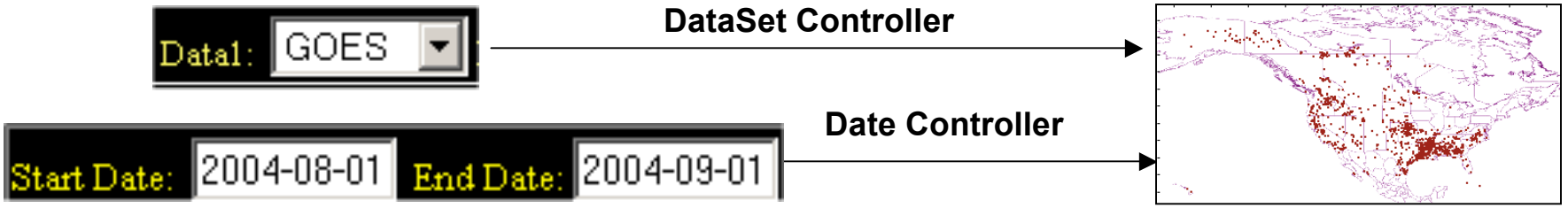
June 25, 2005 Time series for station at southern Nevada/Utah border

Integrated Data Service Flow



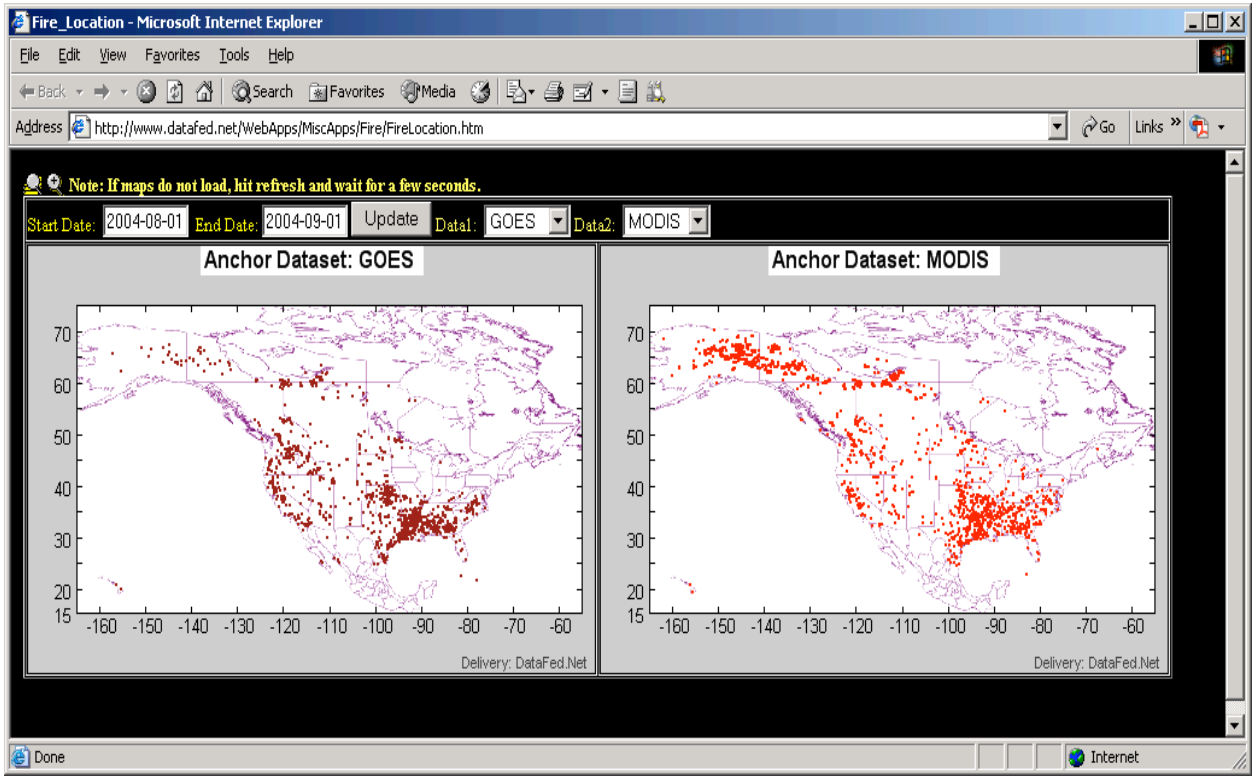
The settings of each web service can be changed by the user, creating a dynamic application

Images + Controllers in a Web Page = Web Application



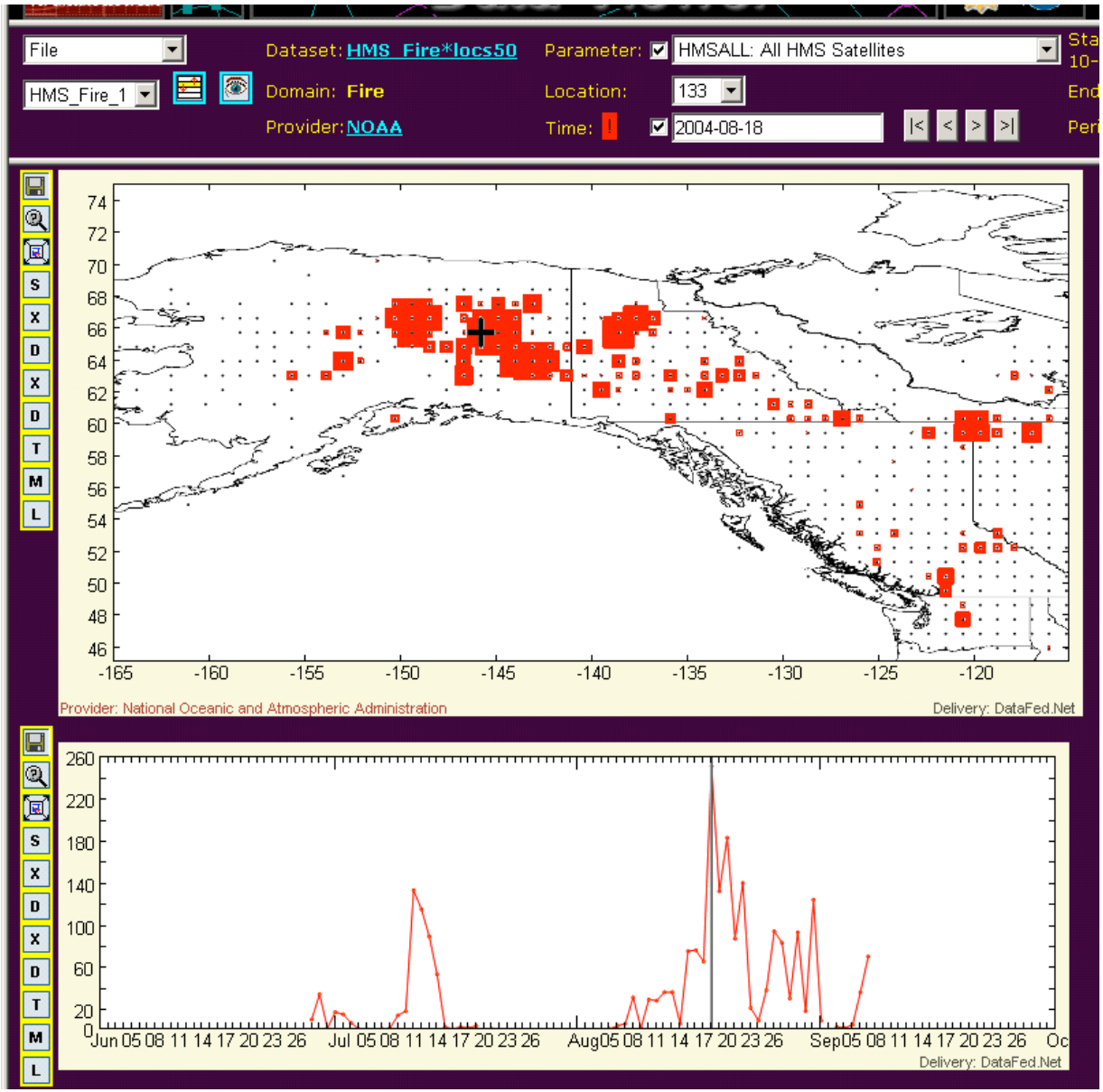
The controllers and map image view can be linked and assembled in a web page. Changing the settings of a controller changes the URL of the map image and updates the web page.

The web page can be constructed using standard web application programming languages, such as JavaScript and ASP.



http://www.datafed.net/WebApps/MiscApps/Fire/FireLocation.htm

Spatial-temporal analysis of fire counts



Large fires during the summer of 2004 in Central Alaska.

Spatially aggregated count of fire pixels over a 100km^2 area.

The size of each red square in the map is proportional to the number of fire pixels.

The spatial aggregation allows the generation of a time series for each aggregated area.

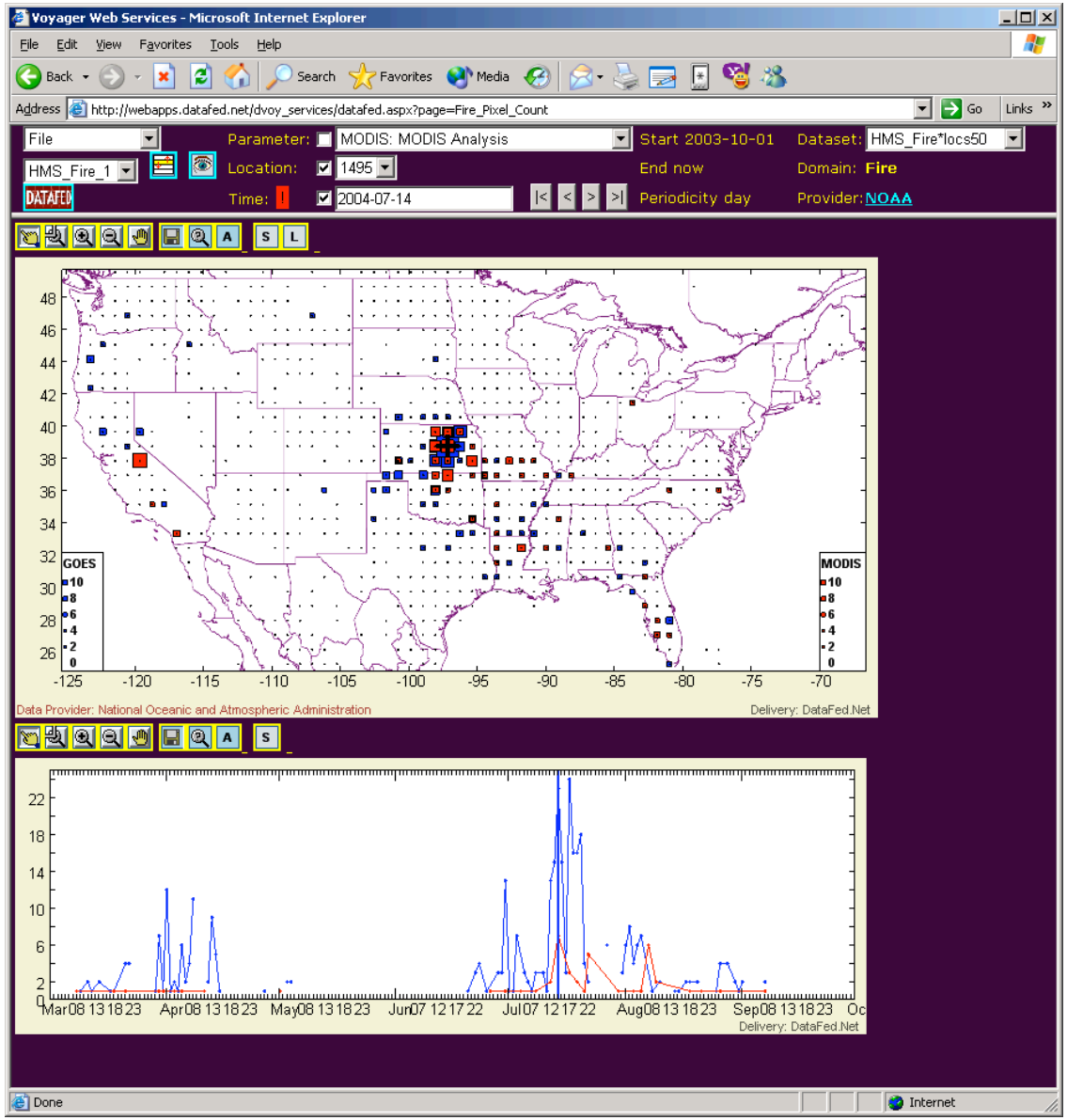
http://webapps.datafed.net/dvoy_services/datafed.aspx?page=Fire_Pixel_Count_AK

Spatial-temporal comparison of satellite derived fire pixels

Aggregating fire location data to a common spatial and temporal frame of reference offers a way to compare multiple datasets.

On July 14, 2004 both **MODIS** and **GOES** fire pixel datasets from the NOAA-NESDIS HMS detect fires in Kansas. In general, GOES contains a larger number of fire pixels due, in part, to its higher sampling frequency (15 minutes versus approximately once per day for MODIS).

The corresponding June-October 2004 time series for the highlighted location superimposes the temporal trend of the **MODIS** (red) and **GOES** (blue) fire pixel count.

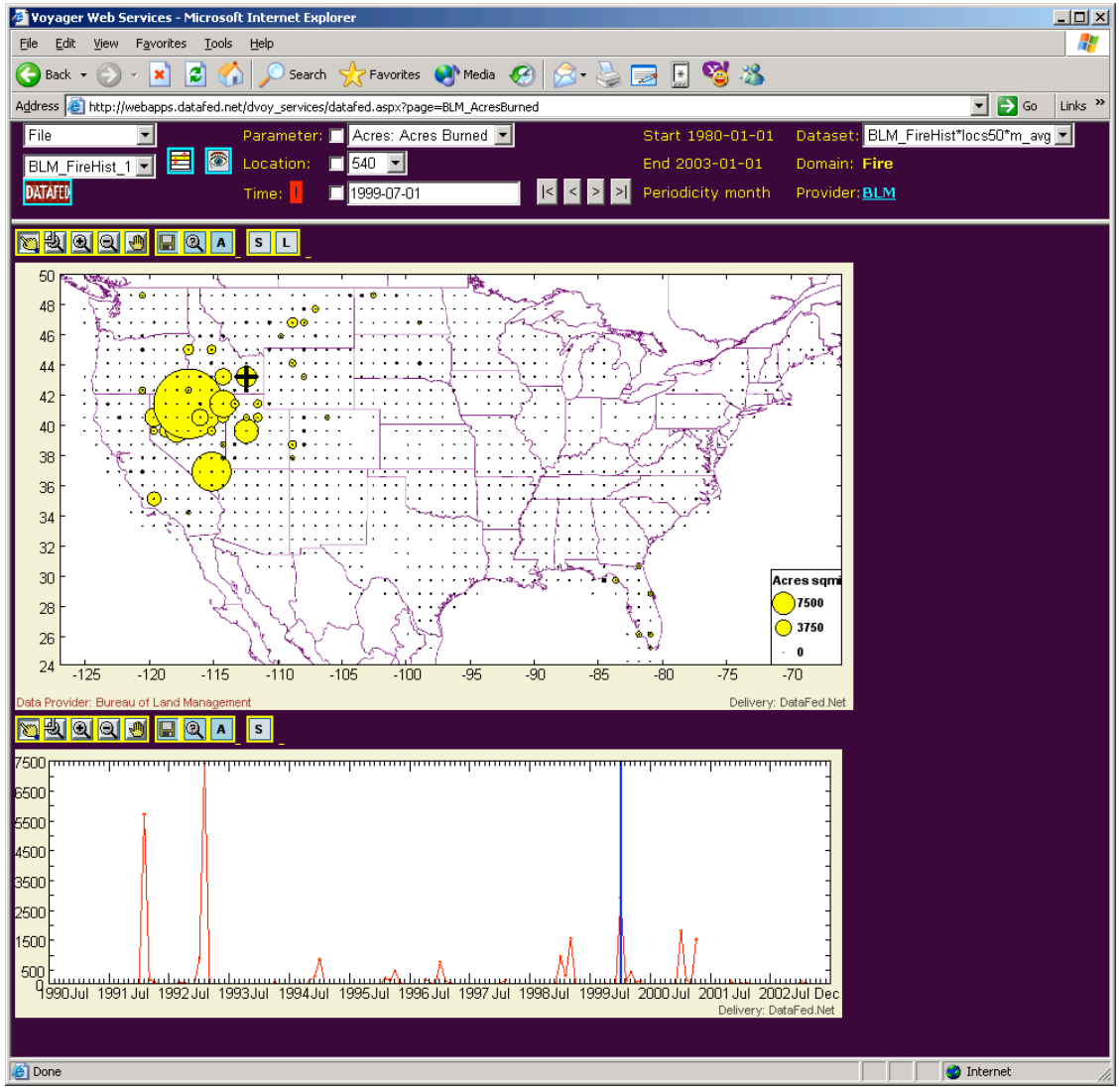


BLM Area burned - monthly average

The acres burned in the BLM compiled fire history dataset are **spatially aggregated** on a 50km^2 grid and **temporally aggregated** to a monthly resolution.

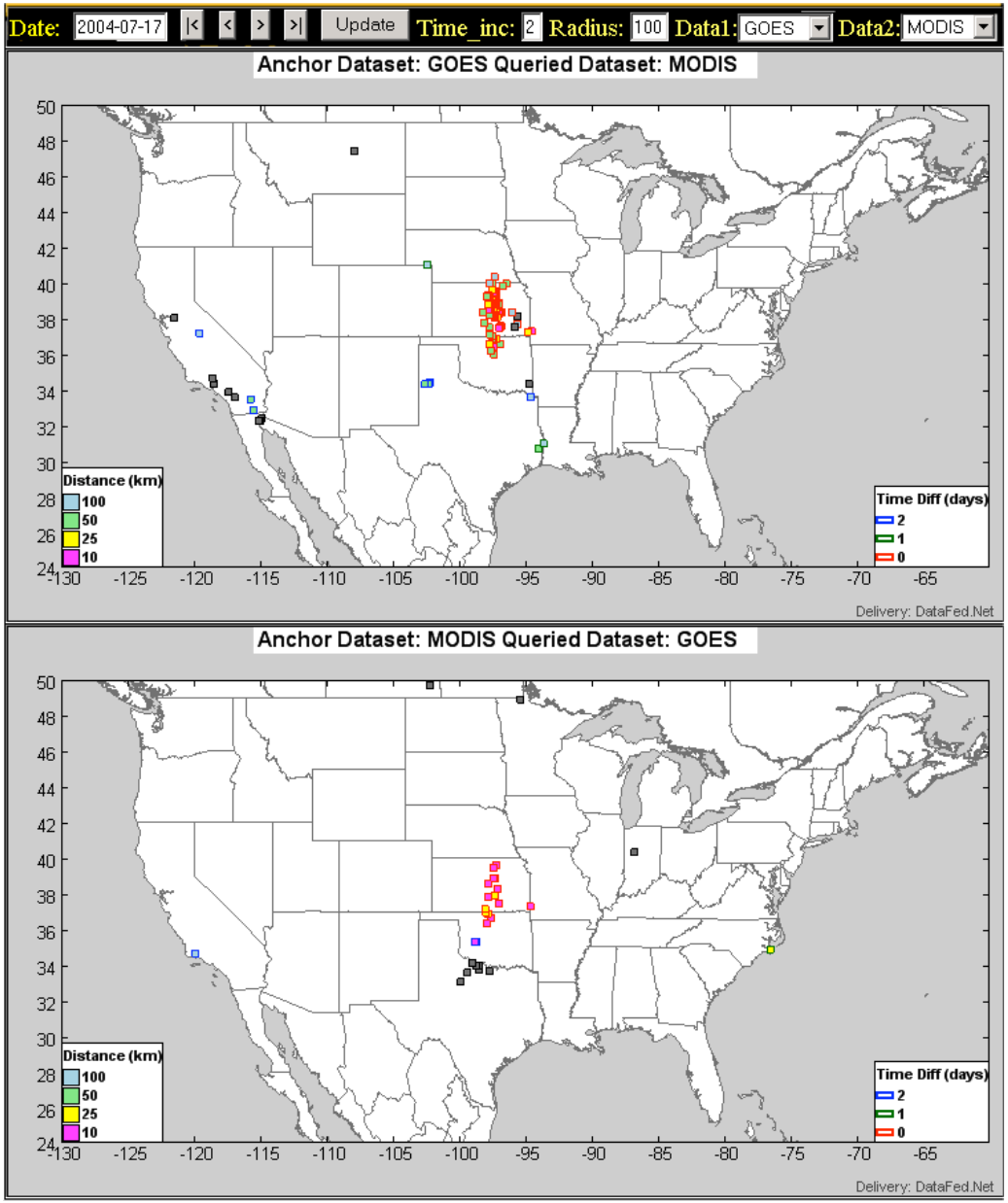
Circles are proportional to the acres burned at a location for a particular year and month.

Time series plot shows the monthly total number of acres burned at a particular 50km2 area.



http://webapps.datafed.net/dvoy_services/datafed.aspx?page=BLM_AcresBurned

Spatial-temporal Comparison of fire pixels



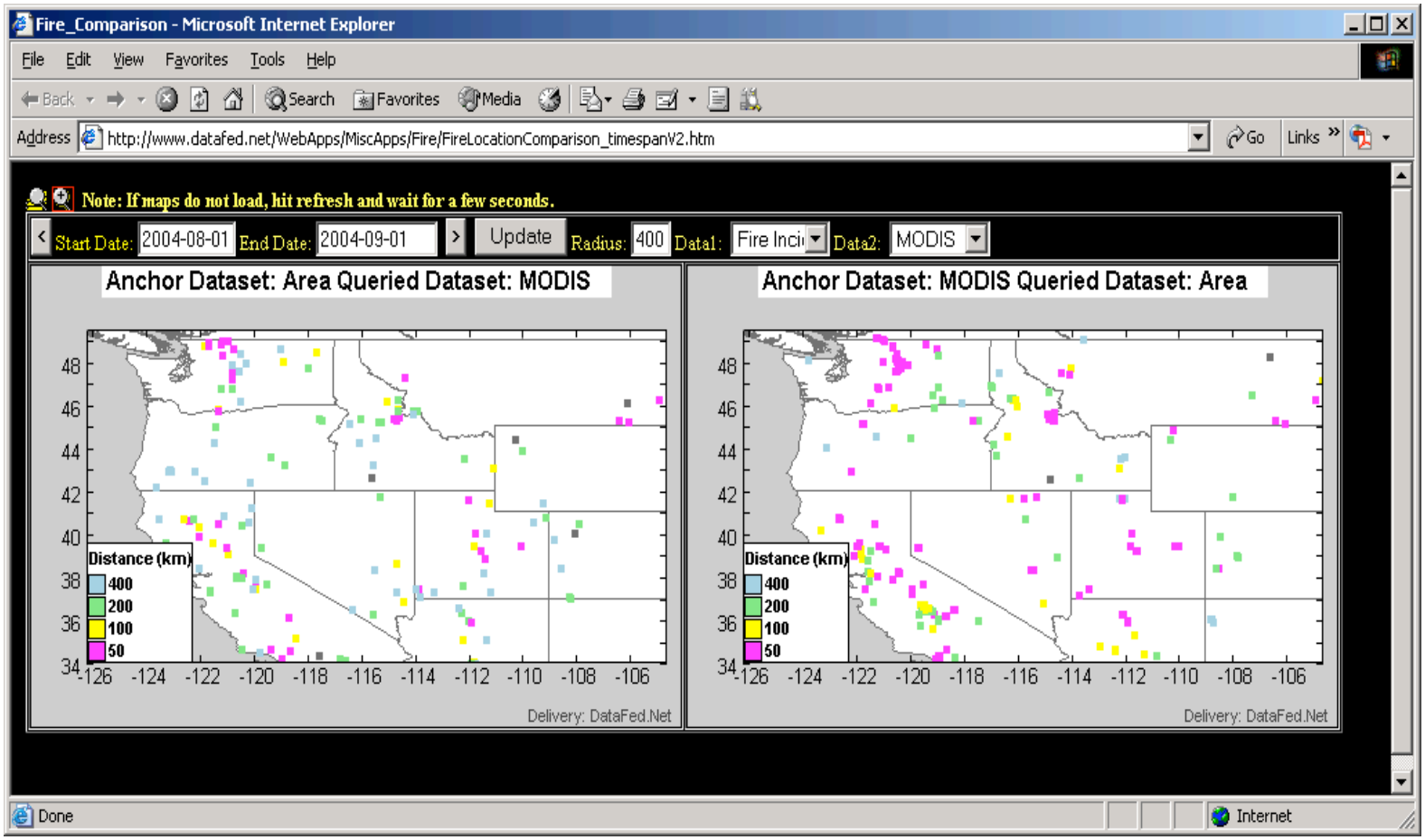
A **red *shaded*** square indicates a **short distance** separating the MODIS and GOES pixels while a **blue *shaded*** square indicates the nearest neighbor between the datasets were **far apart**.

A **red *outlined*** square indicates the nearest neighbor was detected on the **same day** while a **blue *outlined*** square indicates a **longer time separation**.

Gray shaded and/or outlined squares indicate that a nearest neighbor was not found between the two datasets given the search parameters (in this example case, 100 km and 2 days).

http://www.datafed.net/WebApps/MiscApps/ModisGoes/FireLocationComparison.htm

Comparison of satellite and surface fire location data



http://www.datafed.net/WebApps/MiscApps/Fire/FireLocationComparison_timespanV2.htm

A **red** square indicates a **short distance** separating the MODIS fire pixels and FS Fire Incidents while a **blue** square indicates the nearest neighbor between the datasets were **far apart**.

Gray squares indicate that a nearest neighbor was not found between the two datasets.

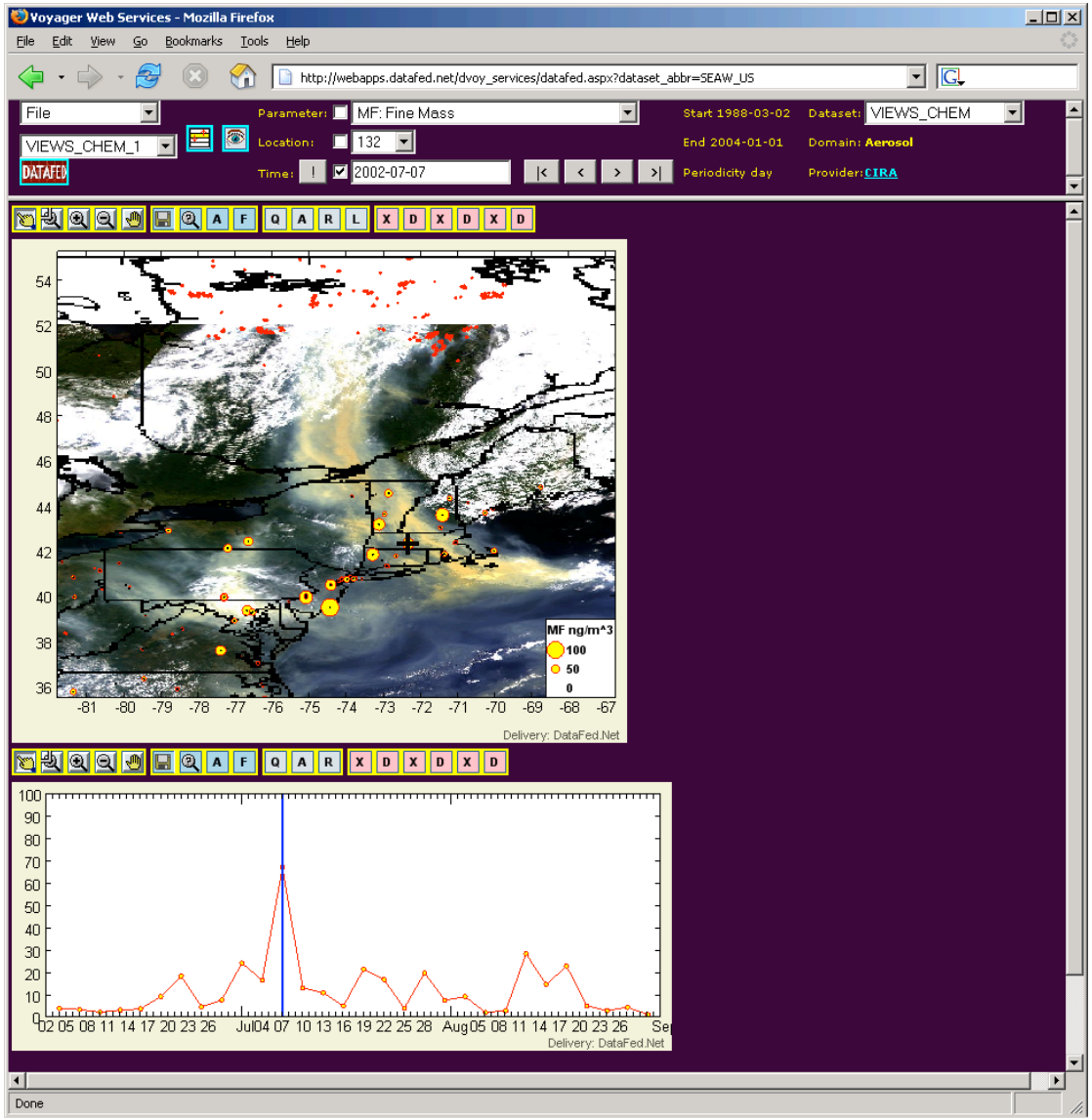
Quebec Fires July 2002

Smoke from fires in Quebec cause high (>65 ug/m^3) concentrations of fine particulate matter in the northeastern US

MODIS fire pixels from Forest Service Remote Sensing Applications Center

SeaWiFS surface reflectance from CAPITA

Air quality (fine mass) concentration data from VIEWS (Colorado State Univ.) database

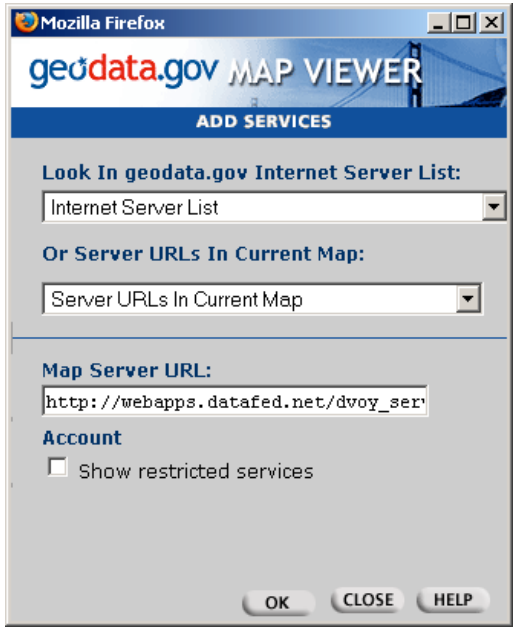


http://webapps.datafed.net/dvoy_services/datafed.aspx?page=Fire/QuebecFiresJuly2002.page

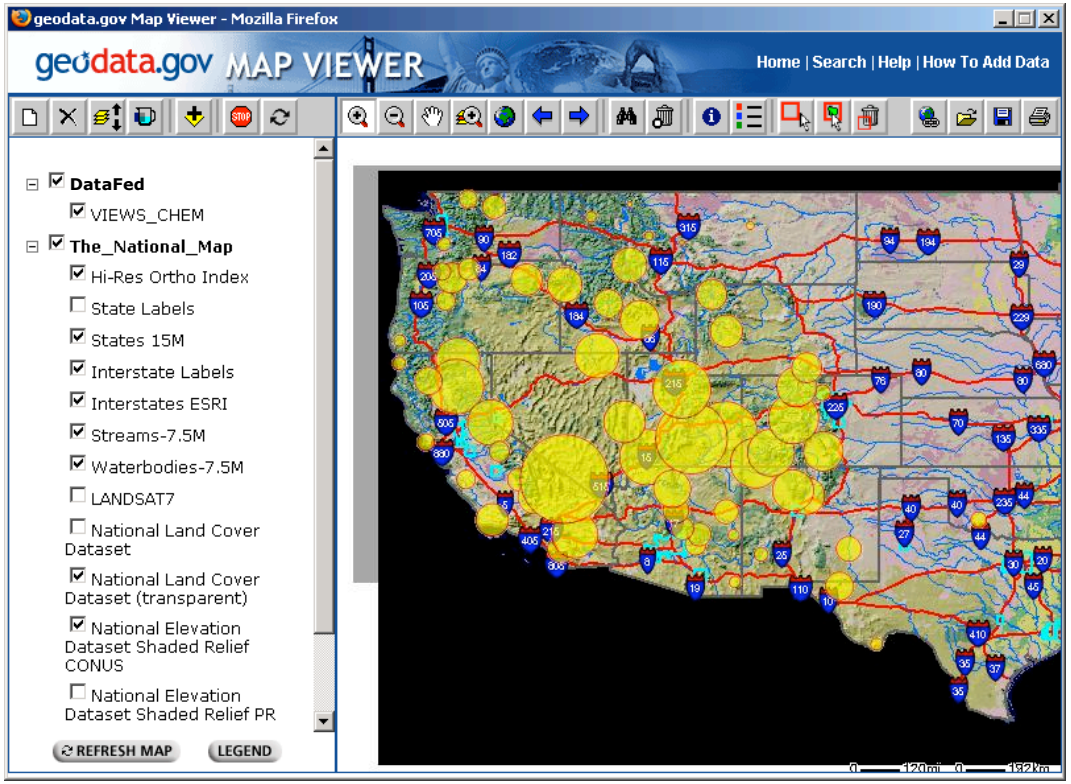
Standards Based Data Sharing

Open Geospatial Specifications (OGC) for web mapping

Web Map Service (images)
Web Feature Service (point/vector data)
Web Coverage Service (gridded data)



Geospatial One-Stop – The National Map



DataFed OGC WMS for fire data:

http://webapps.datafed.net/dvoy_services/ogc_domain_fire.wsfl?SERVICE=WMS&VERSION=1.1.1&REQUEST=GetCapabilities

http://www.datafed.net/DataLinks/OGC/OGC.htm

FASTNET:

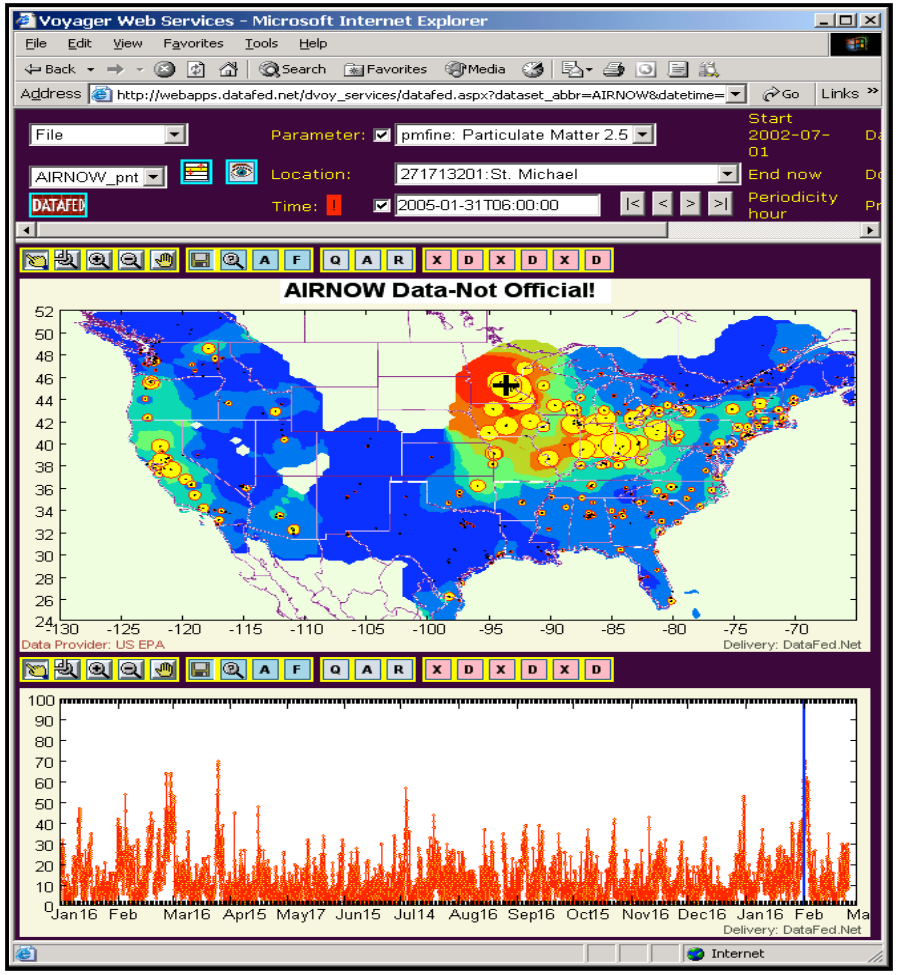
Inter-RPO pilot project, through NESCAUM, 2004

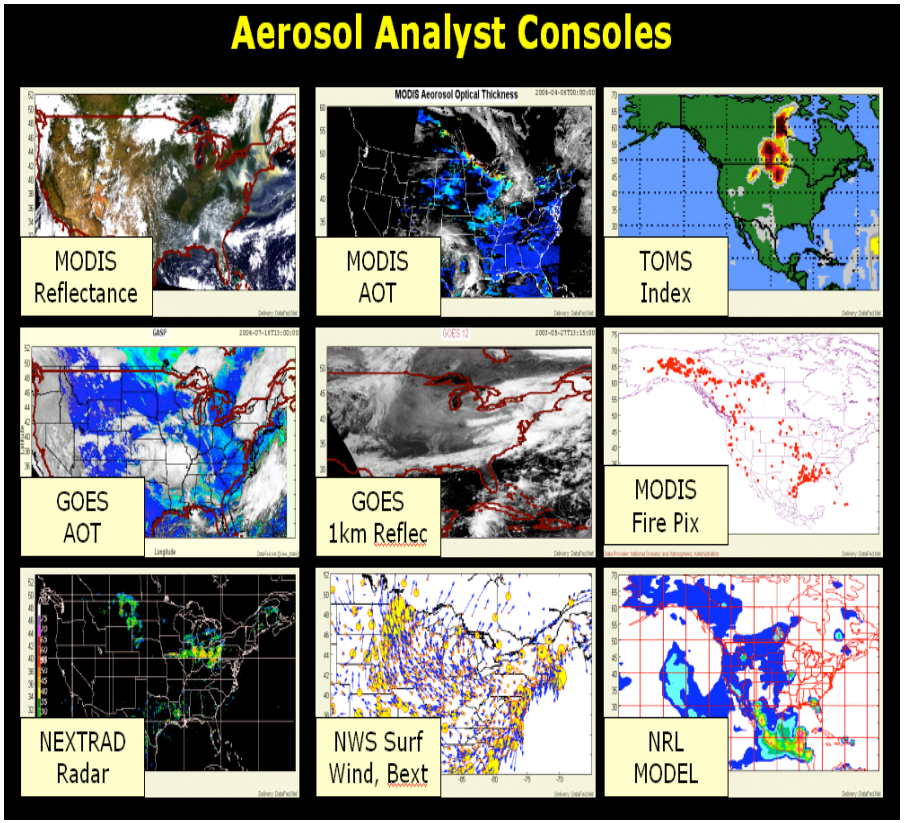
Web-based data, tools for community use

Built on DataFed infra-structure, NSF, NASA

Project fate depends on sponsor, user evaluation

DataFed Tools for Episode Analysis





Viewer: General purpose spatio-temporal data browser and view editor applicable for all DataFed datasets

Consoles: Data from diverse sources are displayed to create a rich context for exploration and analysis

- Data Catalog
- Data Browser
- PlumeSim, Animator

CATT

Combined
Aerosol
Trajectory
Tool